CBSE Board
Class X Mathematics
Sample Paper 3 (Standard)

Time: 3 hrs **Total Marks: 80**

General Instructions:

1. This question paper contains **two parts** A and B.
2. Both **Part A** and **Part B** have internal choices.

Part – A:

1. It consists **two sections** - I and II.
2. **Section I** has **16 questions** of **1 mark** each. Internal choice is provided in **5 questions**.
3. **Section II** has **4 questions** on **case study**. Each case study has **5 case-based sub-parts**. An examinee is to attempt any **4 out of 5 sub-parts**. Each subpart carries **1 mark.**

Part – B:

1. It consists **three sections** – III, IV and V
2. **Section III: Question No 21 to 26** are **Very short answer** Type questions of **2 marks** each.
3. **Section IV: Question No 27 to 33** are **Short Answer Type** questions of **3 marks** each.
4. **Section V: Question No 34 to 36** are **Long Answer Type** questions of **5 marks** each.
5. Internal choice is provided in **2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks**

Part A

Section I

Section I has 16 questions of 1 mark each.

(Internal choice is provided in 5 questions)

1. The HCF of two numbers is 27 and their LCM is 162. If one of the numbers is 54, what is the other number?

OR

Express $0.\overline{8}$ as a fraction in simplest form.

2. If the mean of a data is 27 and its median is 33 then, find the value of mode.

3. Find $\sqrt{\frac{1+\sin A}{1-\sin A}}$.

4. If $\tan\theta = \frac{a}{b}$ then what is the value of $\frac{\cos\theta + \sin\theta}{\cos\theta - \sin\theta}$.

5. What is the value(s) of p, if the distance between the points A(4, p) and B(1, 0) is 5?

OR

A is a point on y-axis at a distance of 4 units from x-axis, lying below x-axis, then what are the coordinates of point A?

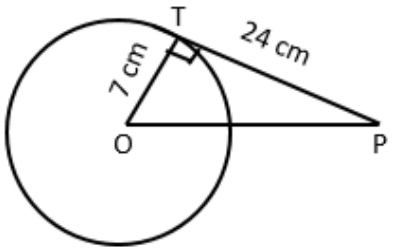
6. In ΔABC and ΔDEF, we have $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = \frac{5}{7}$ then find the value of $\frac{ar(\Delta ABC)}{ar(\Delta DEF)}$.

OR

If $\frac{AD}{DB} = \frac{4}{7}$ and AE = 6 cm where D and E are points on the sides AB and AC respectively of triangle ABC such that DE || BC. Find EC.

7. For an event E, what is the value of P(E) + P(not E)?

8. In a circle of radius 7 cm, tangent PT is drawn from a point P such that PT = 24 cm. If O is the centre of the circle, then find the length of OP.



9. Find the sum of first n even natural numbers.

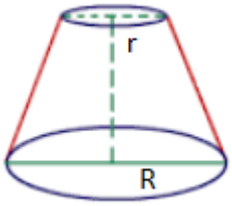
OR

Write the next term of the AP $\sqrt{8}, \sqrt{18}, \sqrt{32}, \ldots$.

10. Find the ratio of the sum and product of the roots of the equation $7x^2 - 12x + 18 = 0$.

11. Find the value of k for which the system of equations 3x + 5y = 0 and kx + 10y = 0 has a non-zero solution.

12. Write the formula for volume of the given figure.



13. If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then find the value of k.

14. If the product of two zeros of the polynomial $f(x) = 2x^3 + 6x^2 - 4x + 9$ is 3, then find its third zero.

15. From the letters of the word "MOBILE", a letter is selected. What is the probability that the letter is a vowel?

16. If PT is a tangent at T to a circle whose centre is O and OP = 17 cm, OT = 8 cm, find the length of the tangent segment PT.

OR

Two concentric circles are of radius 30 cm and 18 cm. Find the length of the chord of the larger circle which touches the smaller circle.

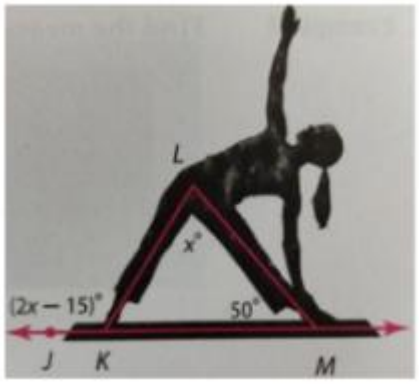
Section II

(Q 17 to Q 20 carry 4 marks each)

Case study based questions are compulsory. Attempt any four sub parts of each question. Each subpart carries 1 mark

17. Case Study based-1
Types of angles and angle sum property of a triangle

It is 7:00 am!
Shikha rolls out her yoga mat and starts her warm up session with stretching and bending. Anaya her daughter is sitting nearby, observing her mother's daily ritual. Anaya takes a picture of her mother while she was in a yoga posture and label it as shown.



(a) Angles ∠LKM and ∠JKL are called as?
(i) Linear Pair of angles
(ii) Vertically opposite angles
(iii) Complementary angles
(iv) Corresponding angles

(b) Find m∠LKM.
   (i) 195° – x
   (ii) 185° – 2x
   (iii) 195° – 2x
   (iv) 185° – x

(c) Find m∠KLM.
   (i) 115°
   (ii) 65°
   (iii) 50°
   (iv) 180°

(d) Which of the following is true for △LKM?
   (i) △LKM is an equilateral triangle.
   (ii) △LKM is an isosceles triangle.
   (iii) △LKM is a right angle triangle.
   (iv) All of the above

(e) What is the measurement of the ∠LKJ?
   (i) 115°
   (ii) 65°
   (iii) 50°
   (iv) 180°

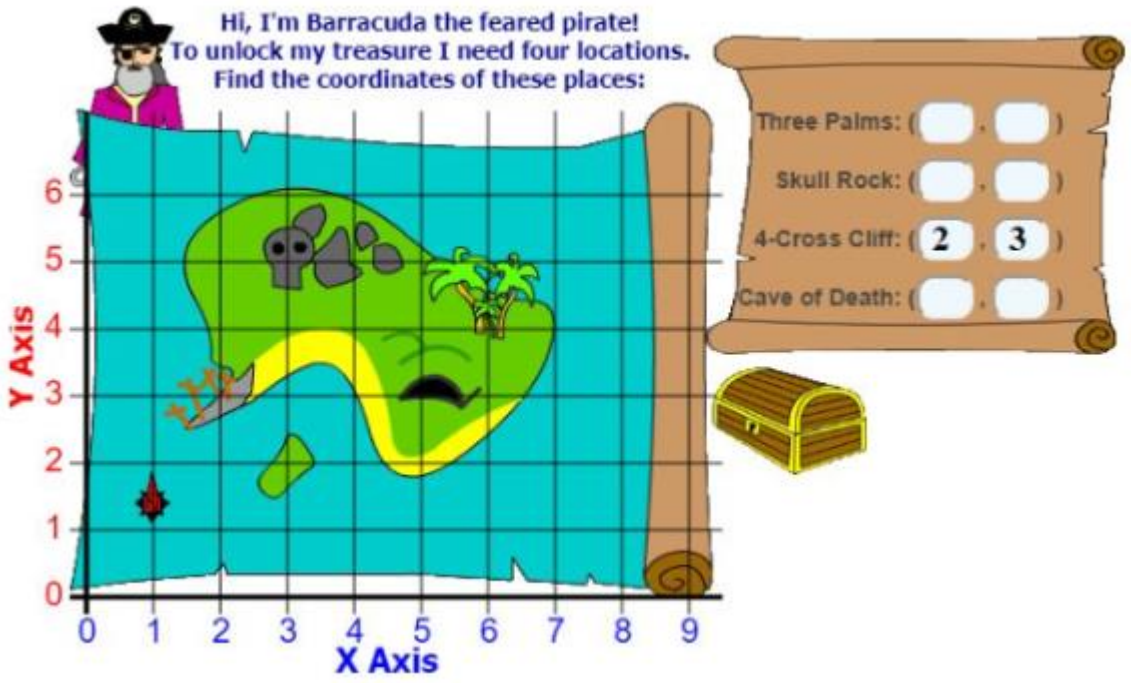
18. Case Study Based- 2
THE TREASURE ISLAND

Understanding Graphs:

On the graph sheet, a point is located using a pair of numbers such as (x, y)

- The first number 'x' shows the horizontal distance of the point (i. e left or right) on the horizontal line.
- The second number 'y' shows the vertical distance of the point (i. e up of down) right) on the vertical line.
- The point where X – axis and Y – axis cross each other at 90° called the Origin denoted by (0, 0).
- Clearly the X – axis and Y – axis divide the plane is known as Cartesian plane.
- We measure everything on the Cartesian plane with respect to Origin.

Rita and Renu are playing a board game of Treasure Island.



(a) The coordinate of CAVE of DEATH
- (i) (3, 5)
- (ii) (3, 3)
- (iii) (5, 5)
- (iv) (5, 3)

(b) The coordinate of THREE PALMS
- (i) (6, 3)
- (ii) (3, 6)
- (iii) (5, 2)
- (iv) (9, 5)

(c) The distance between FOUR CROSS CLIFF and the CAVE of DEATH is
- (i) 3 units
- (ii) 5 units
- (iii) 2 units
- (iv) None of these

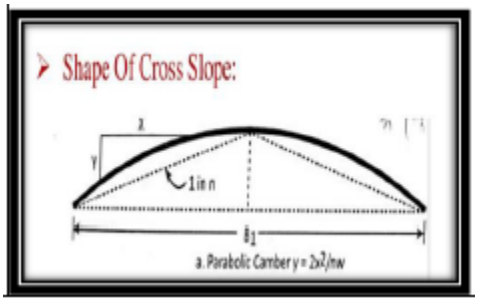
(d) What is the distance of SKULL ROCK from x – axis?
- (i) 3 units
- (ii) 5 units
- (iii) 2 units
- (iv) None of the

(e) The mid – point of CAVE of DEATH and THREE PALMS is
- (i) (5.5, 3.5)
- (ii) (5, 3)
- (iii) (3.5, 5.5)
- (iv) (3, 5)

19. Case Study Based- 3

Applications of Parabolas-Highway Overpasses/Underpasses

A highway underpass is parabolic in shape.

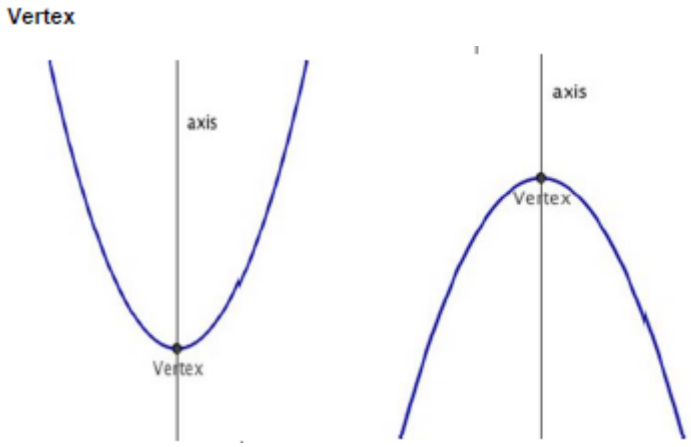


Parabola

A parabola is the graph that results from $p(x)=ax^2+bx+c$

Parabolas are symmetric about a vertical line known as the Axis of Symmetry.

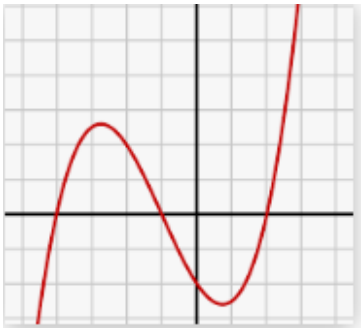
The Axis of Symmetry runs through the maximum or minimum point of the parabola which is called the



(a) If the highway overpass is represented by $x^2 - 18x + 81$. Then its zeroes are

(i) (9, –9) (ii) (9, 9) (iii) (–9, –9) (iv) (–9, 9)

(b)



Zeroes of a polynomial can be expressed graphically.

Number of zeroes of the given polynomial(refer image) is equal to

(i) one

(ii) two

(iii) three

(v) four

(c) The degree of a quadratic polynomial

(i) 0

(ii) 1

(iii) 2

(vi) 3

(d) The representation of Highway Underpass whose zeroes are 6 and 3 is

(i) $x^2 - 9x + 18$

(ii) $x^2 - 12x + 36$

(iii) $x^2 + 18x + 9$

(vii) $x^2 - 3x + 6$

(e) The number of zeroes that polynomial $f(m) = m^2$ can have is:

(i) 1

(ii) 2

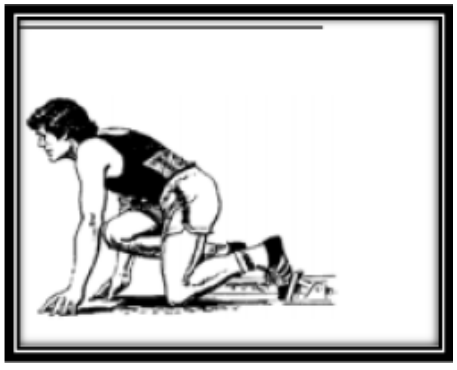
(iii) 0

(iv) 3

20. Case Study Based- 4

110m RACE

A stopwatch was used to find the time that it took a group of students to run 110m.



Time(in sec)	20 – 40	40 – 60	60 – 80	80 – 100	100 – 120
No. of students	7	10	15	5	3

(a) Estimate the mean time taken by a student to finish the race.
   (i) 54.6
   (ii) 63.5
   (iii) 43.5
   (iv) 50.5

(b) What will be the lower limit of the modal class?
   (i) 20
   (ii) 40
   (iii) 60
   (iv) 80

(c) Which of the following are measures of Central Tendency?
   (i) Mean
   (ii) Median
   (iii) Mode
   (iv) All of the above

(d) The sum of upper limits of median class and modal class is
   (i) 60
   (ii) 120
   (iii) 80
   (iv) 160

(e) How many students finished the race within 1 min?
   (i) 18
   (ii) 37
   (iii) 17
   (iv) 8

Part B

All questions are compulsory. In case of internal choices, attempt any one.

Section III

(Q 21 to Q 26 carry 2 marks each)

21. In two concentric circles, the radius of the inner circle is 5 cm. A chord of length 24 m of the outer circle becomes a tangent to the inner circle. Find the radius of the larger circle.

22. How many solid spheres of diameter 6 cm are required to be melted to form a solid metal cylinder of height 45 cm and diameter 4 cm?

OR

Three cubes whose edge measures 3 cm, 4 cm and 5 cm respectively to form a single cube. Find its edge.

23. The sides of a certain triangle are 9 cm, 18 cm, and 16 cm. Determine whether these sides will form a right triangle or not?

OR

Corresponding sides of two triangles are in the ratio 2:3. If the area of the smaller triangle is 48 cm^2, determine the area of the larger triangle.

24. An umbrella has 10 ribs which are equally spaced. Assuming the umbrella to be a flat circle of radius 40 cm, find the area between two consecutive ribs of the umbrella.

25. The angle of depression of a car parked on the road from the top of a 150 m high tower is 30°. Find the distance of the car from the tower (in metres).

26. A box contains 20 cards numbered from 1 to 20. A card is drawn at random from the box. Find the probability that the number on the drawn card is

1. Divisible by 2 and 3

2. A prime number

Section IV

(Q 27 to Q 33 carry 3 marks each)

27. If the roots of the equation $(a - b)x^2 + (b - c)x + (c - a) = 0$ are equal then prove that $2a = b + c$.

28. Prove that $\tan 1^\circ \tan 2^\circ \tan 3^\circ \ldots\ldots \tan 89^\circ = 1$

29. Show that $6 + \sqrt{3}$ is irrational.

OR

Prove that $\sqrt{5}$ is an irrational number.

30. The following table gives production yield per hectare of wheat of 100 farms of a village.

Production yield	50 – 55	55 – 60	60 - 65	65 - 70	70 - 75	75 - 80
Number of farms	2	8	12	24	38	16

Change the distribution to a 'more than' type distribution and draw ogive.

31. Prove that: $\sqrt{\frac{\sec\theta - 1}{\sec\theta + 1}} + \sqrt{\frac{\sec\theta + 1}{\sec\theta - 1}} = 2\,\mathrm{cosec}\,\theta$

OR

Without using trigonometric table, find the value of $\frac{\cos 70°}{\sin 20°} + \frac{\cos 59°}{\sin 31°} - 8\sin^2 30°$

32. Find three terms of an A.P. whose sum is 3 and product is −8.

33. If mean of the following data is 86, then what is the value of p?

Wages (in Rs.)	50-60	60-70	70-80	80-90	90-100	100-110
No. of workers	5	3	4	p	2	13

Section V

(Q 34 to Q 36 carry 5 marks each)

34. Construct a triangle, the lengths of whose sides are 5 cm, 6 cm and 7 cm. Now construct another triangle whose sides are $\frac{5}{7}$ times the corresponding sides of the first triangle.

35. The angle of elevation of a cloud from a point 60 metres above a lake is 30° and the angle of depression of the reflection of the cloud in the lake is 60°. Find the height of the cloud.

OR

The angle of elevation of a cloud from a point 'h' m above a lake is α and the angle of depression of its reflection in the lake is β. Prove that height of the cloud is $\frac{h(\tan\beta + \tan\alpha)}{\tan\beta - \tan\alpha}$.

36. A lead pencil consists of a wood cylinder with a solid cylinder of graphite fitted into it. The diameter of the pencil is 7 mm. The diameter of the graphite is 1 mm and length of the pencil is 10 cm. Calculate the weight of whole pencil in grams if the density of the wood is 0.6 gm/ cm^3 and of graphite 2.3 gm/ cm^3.